

Computer Assisted Testing  
(CAT)

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## I BACKGROUND

Several people have expressed an interest in learning more about how the computer could be used to assist in the preparation, grading and evaluation of examinations. This paper is an attempt to briefly summarize a presentation given to several OSU faculty members on February 4, 1975. Hopefully this written explanation will provide an opportunity for others to study the feasibility of this type of program in courses which they teach.

The format of the CAT program is not fixed. In fact, before continuing to develop the program, suggestions from potential users as to how it might be modified to better fit into their courses would be helpful.

As total university student enrollment has grown, the average class size has tended to increase. For many people, this may seem to be a good case for the application of the economies of scale. However, frequently it is not realized how little of a teacher's time is saved by increasing class size.

Four or five years ago the Introduction to Agricultural Economics course (Ag. Ec. 100) had 30 to 40 students per each of three or four sections per quarter. During recent quarters, the enrollment has frequently been more than 100 students in one or more sections with other sections having 70-80 students. Some time ago it became evident that with larger and larger classes less and less time was available to devote to those things which contribute to a good learning experience for students. Time for reading new textbooks to see how different authors present similar material, revising lecture notes and visuals, thinking of examples to illustrate the material so more students can relate to it, consulting with students who have difficulty with the subject

matter, etc. Instead, much of one's time is required for grading papers, exams, quizzes, etc.

Traditionally, in Ag. Ec. 100, I have given three exams, six homework problems, and approximately six quizzes. I gradually discovered that not only did I have insufficient time, but I lacked the ability to objectively score more than 40-50 exams or papers, containing several open ended questions.

To better evaluate the situation, let us look at a comparison of the time required to teach a 5-hour, introductory course with different class sizes (Table 1). Indeed there are some economies of scale, as class size increases from 16 to 150 (approximately 9 fold) the number of hours required per quarter to teach the course increases from 113 to 451 (only 4 fold). However, the 451 hours/qtr. required to teach 150 students is 113 percent of a normal (40 hours/week) work load. An instructor must resort to using either his evenings or weekends (or both) if he wishes to maintain the same quality of teaching.

Many professors probably follow the same pattern as I did. I used graduate students, then undergraduate students to grade the homeworks, exams and quizzes. Then I began to reduce the amount of time spent with a student in my office. Neither of these were an improvement upon the overall teaching of the course. Student graders were equally as prone to errors and fatigue from grading a large quantity of exams or papers as I was.

A couple of years ago, it became obvious that if more time were devoted toward the preparation of exam and quiz questions, less time would be needed for grading them. OSU already had the facilities for scoring and evaluating exams electronically if the questions were objective and each had no more than five alternative responses. The obvious conclusion was, "Why not let the computer prepare the exam, too?"

Table 1. Comparison of Time Required to Teach a 5-hour Introductory Course with Different Class Sizes

Professional Activity	Number of Students							
	16		40		79		150	
	Hrs.*	Index**	Hrs.*	Index**	Hrs.*	Index**	Hrs.*	Index**
Classroom	50	12	50	12	50	12	50	12
<u>Three Exams</u>								
Preparation -- 3 hrs/exam	9	2	9	2	9	2	9	2
Grading -- 10 min/student/exam	8	2	20	5	40	10	75	19
<u>Six Homework, term paper, etc.</u>								
Preparation -- 2 hrs/homework	12	3	12	3	12	3	12	3
Grading -- 12 min/student/homework	19	5	48	12	95	24	180	45
<u>Six Quizzes</u>								
Preparation -- 20 min/quiz	2	-	2	-	2	-	2	-
Grading -- 3 min/student/quiz	5	1	12	3	24	6	45	11
Student consultation in office (1 of every 32 students each day for 20 minutes)***	8	2	21	5	41	10	78	20
	<u>113</u>	<u>28</u>	<u>174</u>	<u>43</u>	<u>273</u>	<u>68</u>	<u>451</u>	<u>113</u>

\* Hours/quarter

\*\* 400 hrs/qtr = 100

\*\*\*  $\frac{\text{no. of students}}{32} \times \frac{20}{60} \times 5 \text{ days} \times 10 \text{ wks}$

## II Question Bank and Classification

Once grading and evaluation of exams by computer was undertaken, it became obvious that some method of storing the analytical information on each question was needed. To begin with, 3 x 5 double perforated cards, from Information Retrieval Systems, were used. On the back of each card a grid was stenciled for recording, from the evaluation printout, the following information (see Figure 1):

- 1) QTR - the quarter when the question was used
- 2) YR - the year
- 3) USE (Q/E) - whether the question was used for a quiz (Q) or an exam (E) and whether it was the 1st, 2nd, 3rd, etc. given during the quarter.
- 4) % CORR - percent of students who got this question correct.
- 5) D.I. - discrimination index; how well this question discriminates between the upper 27.5% and the lower 27.5% of the class as determined by this exam or quiz.
- 6) Sig. - level of significance of the correlation phi (an item-item relationship of upper and lower 27.5 percent).

As can be seen (Figure 1), this particular question was used Su Qtr 1974 on the first quiz and only 5.9% of the students got it correct. It had a D.I. of zero and the corr. phi was non-significant.

The original intent was that the perforated cards would be punched so cards could be quickly sorted with a steel rod. However, the bank of questions exceeded 1,000 before the manual sorting could be implemented. Also, the perforated cards cost five cents each which would make them impractical for future use when duplicate cards would occur. Presently plain 5 x 8 file cards are used as the organizational base.

Obtaining additional questions for the "bank" has taken more than two years. One of the best ways is to ask students to write questions using

[illegible]

economic principles in their own area of interest or major. Of course, a carrot in the form of "bonus" points added to their regular grade usually stimulates their interest. Between 2,000 and 2,500 questions are now on file for Ag. Ec. 100.

No more than a few hundred questions were recorded on cards when it became obvious that some systematic way of filing would be necessary. Several people have been involved in teaching Ag. Ec. 100 during recent years, and the course has also changed text books as well as outlines. It was felt that a general economic classification was needed. Ten major headings were selected which included most of the concepts taught in lower-level economic courses. Each major heading was divided into 5-10 sub-headings. Then following each sub-heading a list of suggested topics to which questions included in that classification should relate (see App. A for the complete classification used in Ag. Ec. 100).

Approximately 55 distinct classifications were initially developed for Ag. Ec. 100. It was felt that this amply segmented the questions into topics which would be compatible with any way the course might be taught by anyone in the future. Of course, additional classifications could be added in the future if necessary.

Not all students, or teachers, are prone to like, or use, the same types of questions. Some persons have a mental block against true-false or multiple choice, or some other type. For the Ag. Ec. 100 course, questions consisted of five different types: (1) true-false, (2) multiple choice, (3) fill in the blanks, (4) definitions, and (5) problems. Of course, to be machine graded, each of the five types of questions must have the correct answer among no more than five alternatives (see Appendix B for examples of how each of these five types of questions can be adopted for machine grading).



Professors who like to provide students an opportunity to explain their reasoning for answering a question can ask for short explanations on the exam form. These can then be graded as part of the exam or counted as bonus points. This is also true of the problems. Frequently a student will obviously know the correct procedure but get an incorrect answer because of an error in arithmetic. If the course grade is based upon total points (i.e., 1,000) instead of percentage points, many variations of scoring and grading exams can be combined.

Up to this point, there may appear to be very little saving of time through using CAT. That is true; for example in Ag. Ec. 100, the 55 sub-headings each with 4-5 types of questions mean a total of about 250 classifications. If each of these 250 classifications has 10-50 questions, the "bank" would quickly approach a requirement of 4-5,000 questions. That, in fact, is the goal for this course. However, it is not that time consuming because most people teaching courses with large enrollment have already developed some system for filing questions.

The Ag. Ec. 100 question bank and classification has been designed for a maximum amount of flexibility because of the number of people involved in teaching it. A course which is taught by only one or two people could use a course outline as the basis for the classification of questions. Old classifications could be combined and/or new ones added if the course were subsequently modified. It should also be obvious that one does not need 4,000 questions to begin using this system.

It should be emphasized that most of the time and effort required to set up a computer program for writing, grading and evaluating exams is in preparing the bank of questions and their identifying classifications. Unless an adequate number of well written questions and a meaningful classification system are developed the computer will only add confusion to an already chaotic situation.

### III COMPUTER EXAM EVALUATION

The Office of Evaluation at The Ohio State University has an item analysis program with which most people are familiar. To obtain the maximum utility from the CAT program, some system of exam question evaluation should be used. Systematic exam evaluation is necessary if undesirable questions are to be modified or discarded.

Although most people are familiar with the OSU computer exam evaluation program, a brief review may be helpful (references will be made in this section to the print-out contained in Appendix C). The exam must be designed as explained in the previous section and Appendix B. All responses are marked on a scanner sheet (Figure 2) with a soft leaded pencil. Grades will be reported by either the student's name or identification number (usually social security). The number of items answered correctly will be marked along one edge of the scanner sheet. However, no indication will be given on the scanner sheet as to which questions were answered correctly.

Usually once each quarter, with the first exam, a set of instructions interpreting the analysis will be included with the print-out. The print-out is divided into five parts (each statistic under each part is defined in Appendix C, pp. 36-37):

1. Test score distribution -- frequency, cumulative frequency, percentile rank, and standard score (for both weighted and unweighted scores, Appendix C, pp. 38-39).
2. Summary statistics -- number of questions scored, number of students, mean, median, mode, range of scores, etc. for both weighted and unweighted scores (Appendix C, pp. 38-39).
3. Item analysis -- this is the part most important for CAT. See Appendix C, pp. 36-37 for an explanation of the statistics provided on each question. Different people use different statistics from the item analysis; however, PCT (percent answering correctly), OBTAINED D (discrimination index), and SIG (statistical significance of the



EXAMPLE:  
RIGHT  
WRONG  
USE PENCIL ONLY

Print all required information in appropriate boxes. Then darken matching grids below.

YOUR LAST NAME		FIRST NAME		MI																																																																																																																																																																																																																																																																																																																											
1	T	9	T	17	T	25	T	33	T	41	T	49	T	57	T	65	T	73	T	81	T	89	T	97	T	105	T	113	T	121	T	129	T	137	T	145	T	153	T	2	T	10	T	18	T	26	T	34	T	42	T	50	T	58	T	66	T	74	T	82	T	90	T	98	T	106	T	114	T	122	T	130	T	138	T	146	T	154	T	3	T	11	T	19	T	27	T	35	T	43	T	51	T	59	T	67	T	75	T	83	T	91	T	99	T	107	T	115	T	123	T	131	T	139	T	147	T	155	T	4	T	12	T	20	T	28	T	36	T	44	T	52	T	60	T	68	T	76	T	84	T	92	T	100	T	108	T	116	T	124	T	132	T	140	T	148	T	156	T	5	T	13	T	21	T	29	T	37	T	45	T	53	T	61	T	69	T	77	T	85	T	93	T	101	T	109	T	117	T	125	T	133	T	141	T	149	T	157	T	6	T	14	T	22	T	30	T	38	T	46	T	54	T	62	T	70	T	78	T	86	T	94	T	102	T	110	T	118	T	126	T	134	T	142	T	150	T	158	T	7	T	15	T	23	T	31	T	39	T	47	T	55	T	63	T	71	T	79	T	87	T	95	T	103	T	111	T	119	T	127	T	135	T	143	T	151	T	159	T	8	T	16	T	24	T	32	T	40	T	48	T	56	T	64	T	72	T	80	T	88	T	96	T	104	T	112	T	120	T	128	T	136	T	144	T	152	T	160	T

Figure 2. Scanner sheet used for electronic scoring of exams.

correlation phi) are some of the more useful. (See Appendix C, pp. 40-41). One should also note how many (if any) students answered each of the alternative responses. This can aid in the reformulation of questions and answers for a better exam question.

4. Summary statistics -- a number of summary statistics for the exam as a whole are given. Of major importance are the Kuder-Richardson 20 and 21 (KR 20 and KR 21) statistical tests (see Appendix C, p. 37 for an explanation of these and Appendix C, p. 42 for an example).
5. Student scores -- each student is listed alphabetically (or numerically) with his rank from the lowest score, weighted score, percentile rank from the bottom (i.e., 467 = 46.7% of the students did worse than he), standard score, and raw test score (see Appendix C, p. 43).

IV  
COMPUTER EXAM PREPARATION

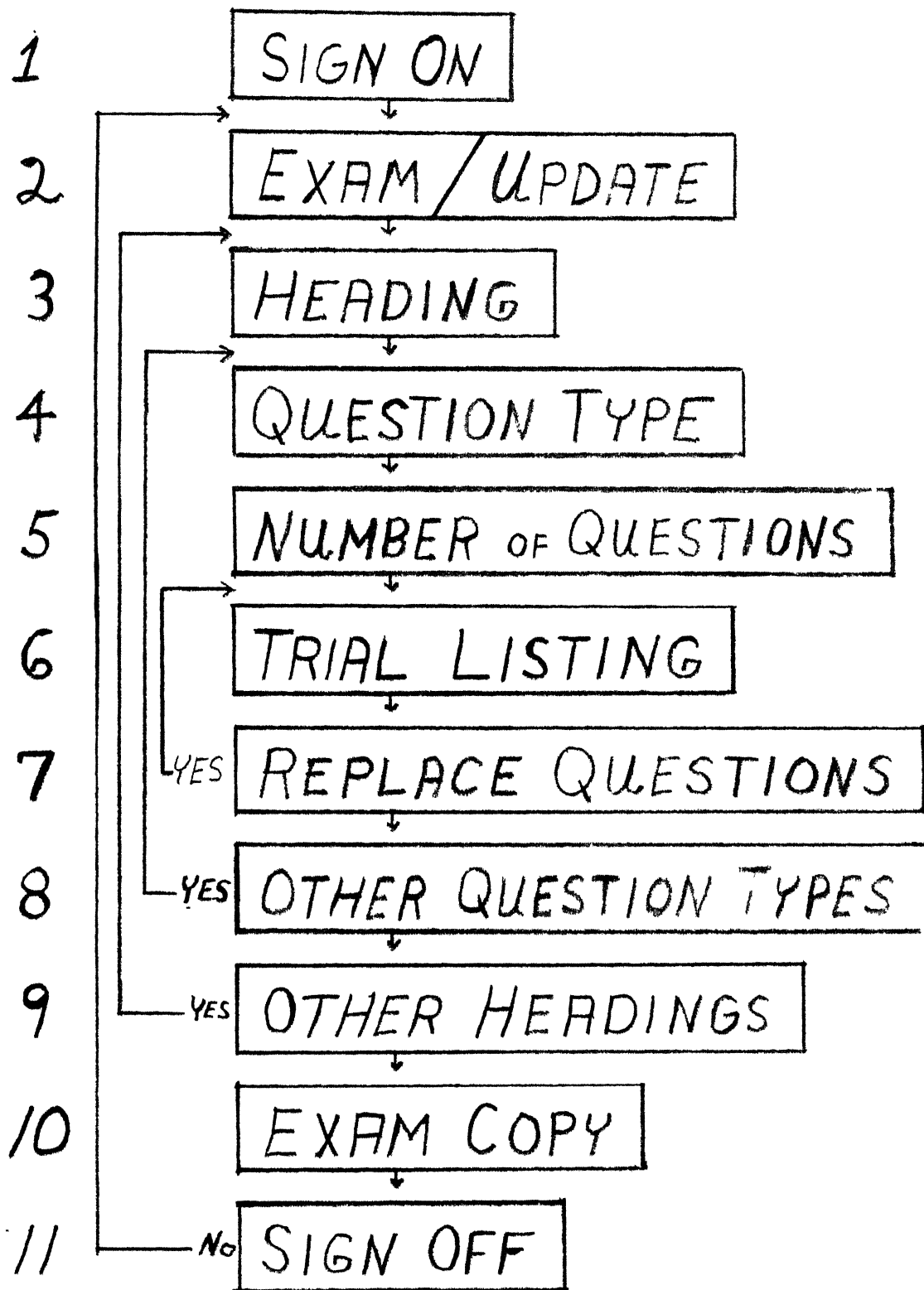
Once a sufficient number of cards with questions has been prepared with the appropriate statistical information recorded for each question (see sections II and III). The questions can be transferred to IBM cards, tapes, or storage discs. From this point, the intention is that a professor could access the main terminal through a remote terminal and through a series of commands and trial listings have the computer prepare an exam in final form which could be run through the total copy machine. With the exception of running off the required number of copies, the whole procedure should take no more than 30 minutes.

Writing an exam would be a stepwise procedure requiring a minimum of 11 steps (see Figure 3). These steps would be:

1. Sign on. Each course and instructor would have a specific identification number and access routine.
2. Exam/Update. Once properly logged on the user would indicate whether he wished an exam written or whether he merely wanted to update or modify parts of the question bank. If an exam were indicated, the computer would ask for Step 3.
3. Heading. The user would indicate which headings and sub-heading from which the questions should be selected. (See Appendix A for headings used in Ag. Ec. 100). For example, if he wished questions on agriculture in the U.S., macro-profile of U.S., monetary and fiscal policy, and economic systems he would list I,B,E,F,G. This tells the computer to search only these four sections for the questions. Then the computer would call for Step 4.
4. Question Type. As previously indicated, I use five types of questions in Ag. Ec. 100. Let's assume that we wish to begin with true-false questions. The command TF would be given to the computer and it would ask for Step 5.
5. Number of Questions. Again as an example, I usually have eight TF questions on an exam. The command 8 would be given and computer would proceed to Step 6.
6. Trial Listing. The computer would randomly select eight questions out of sections I. B, E, F and G and print them

Figure 3.

# CAT FLOW CHART



along with the biographical and statistical data stored for each question (see Figure 4 for an example of what a trial listing might contain). Before proceeding to Step 7, there would be ample time to study the trial listing of questions.

7. Replace Questions. The user would be asked if any of the questions in the trial listing should be replaced. If yes, the computer would provide another trial listing including replacements. If no, the computer would proceed to Step 8.
8. Other Question Types. I personally like to group all my true-false together, followed by multiple choice, or some other type of question. However, for a quiz I usually use all one type of question. Assuming that we are preparing an exam and I wanted a section of multiple choice (MC) questions, the command MC would be entered here. The computer would then recycle to Step four. The circle would be continued until all the types of questions desired were selected. If no other type questions were needed the computer would proceed to Step 9.
9. Other Headings. This is an expansion step which would permit the TF questions from selected headings and other types of questions from other headings. If no other heading were desired, the computer would move into Step 10.
10. Exam Copy. Each course and/or user would have a specific title format for the exam. The computer would begin with that and then proceed to list the questions numerically in the order they were called for. The exam format would be such that it would copy onto an 8 1/2 by 11 page (the final exam would be similar to the form seen in Appendix B).
11. Sign Off. Finally the user would have the option of signing off or returning to Step 2 to prepare another exam or to update the question bank.

The program update would be simple enough so the user could add or delete questions easily. For planning purposes, the estimated number of each type of question anticipated in each of the sub-headings for the first two major headings of Ag. Ec. 100 is given in Table 2.

At this stage of development, it appears as if the updating of each question after being used on an exam could be done with a simple supplementary program. The statistical and user data from the exam evaluation (Appendix C) could be punched on cards simultaneously with the evaluation print-out. It would be a fairly simple routine to update each question, as used, in the bank.

# FORMAT FOR TRIAL LISTING

(1)	(2)	(3)	(4)	(5)	(6)
I. A. 1.	TEXT	9/73	46.4	A	WESSEL
I. A. 21.	OF	2/74	31.8	E	HAHN
II. B. 9.	QUESTION	12/71	0.0	B	HIMES
II D. 14.		1/75	11.2	A	WESSEL

- 1) HEADING/SUBHEADING, SEQUENCE NO. OF QUEST.
- 2) THE COMPLETE QUESTION
- 3) DATE LAST USED
- 4) DISCRIMINATION INDEX
- 5) CORRECT ANSWER
- 6) PROFESSOR LAST USING



Table 2.

## CAT QUESTION BANK

HEADING		TYPE OF QUESTION					TOTAL
MAJOR	SUB	TF	MC	BK	DF	PE	
(No. OF QUESTIONS)							
I	A	20	20	15	10	0	65
	B	15	15	10	5	0	45
	C	10	10	5	5	0	30
	D	20	20	10	5	5	60
	E	25	25	10	10	0	70
	F	25	25	15	15	0	80
	G	20	20	10	10	0	<u>60</u>
							410
II	A	20	20	10	10	5	65
	B	15	15	10	10	5	55
	C	30	30	15	15	10	100
	D	15	15	10	10	0	50
	E	25	25	10	10	10	80
	F	15	15	10	10	0	50
	G	20	20	10	10	10	<u>70</u>
							470

V  
SUMMARY

The obvious conclusion from this presentation of CAT is that if one has fewer than 50 students in a class or plans to teach the course no more than a few times, it's not worth the hassle. It is impossible to estimate the number of hours devoted to preparation of questions--and presently the "bank" contains only one half as many as are desired.

Frequently students in Ag. Ec. 100 receive bonus points if they write good exam questions. Also, it is desirable to indicate the type of questions or sub-headings under which the questions must fit. Students are encouraged to write questions which are an application of economic principles in their field.

The optimum level of development of CAT would be a sufficiently large bank of questions so each student could access the computer directly for a review exam.

Obviously there is many a "slip twixt the cup and the lip;" comments and suggestions are solicited for improvement from anyone who has an interest in using computers to prepare and analyze exams or for other classroom use. Computers can never replace good, dynamic teachers, but maybe they can help extend the benefits of those who are trying to do a good job.

Within the near future hopefully a testable program will be ready. At that time its potential can be discussed in more detail.

## Appendix

### A

Major Heading and Sub-Headings,  
With Suggested Topics for Specific Questions

Computer Assisted Testing (CAT)

Major Headings and Sub-Headings, With Suggested Topics for Specific Questions

I. Overview For Agricultural Economics

A. Introduction

- (1) Why & what of economics
- (2) Role of economics
- (3) Agriculture & agricultural economics
- (4) American development

B. Agriculture in the U.S.

- (1) Colonial America (1607-1776)
- (2) Transition period (1776-1865)
- (3) Commercial agriculture (1865-present)
- (4) Persisting problems

C. Agriculture and the State of Ohio

- (1) Principle crops
- (2) Contribution to gross output
- (3) Rural-urban population
- (4) Future role

D. Statistical Reporting

- (1) Tables, graphs & charts
- (2) Indices
- (3) Data sources

E. Macro-Profile of U.S.

- (1) GNP & NNP
- (2) Farmers and GNP
- (3) Macro vs. Micro economics
- (4) How do we measure the economy's performance
- (5) Circular flow

F. Monetary and Fiscal Policy

- (1) Sources and function of money
- (2) Federal Reserve System
- (3) The multiplier
- (4) Savings and investment
- (5) Fiscal policy
- (6) Inflation and deflation
- (7) Public debt

G. Economic Systems

- (1) Capitalism
- (2) Socialism
- (3) Fascism
- (4) Communism

## II. Personal Finance and Management

### A. Corporate Stocks

- (1) Reading the quotations
- (2) Evaluation and analysis of firms
- (3) Brokers purpose and fees
- (4) Preferred vs. common stock

### B. Bonds

- (1) Reading financial papers
- (2) Determination of real interest rate
- (3) Types of bonds

### C. Commodity Futures Market

- (1) Commodities traded
- (2) Reading the price quotations
- (3) Speculation
- (4) Hedging

### D. Insurance and Risks

- (1) Life
- (2) Property
- (3) Liability

### E. Borrowing Funds

- (1) Sources and types of loans
- (2) Calculating interest charges
- (3) Present and future value
- (4) Home mortgages

### F. Personal Taxes

- (1) Federal
- (2) Record keeping
- (3) Deductions

### G. Real Estate Investment

### III. The Factors of Production

#### A. Natural Resources

- (1) Land
- (2) Water
- (3) Mineral
- (4) Air
- (5) Climate

#### B. Human Resources

- (1) Population and labor
- (2) Education
- (3) Migration
- (4) Health
- (5) Housing
- (6) Rural-urban differences

#### C. Capital Resources

- (1) Productive assets
- (2) Credit
- (3) Infrastructure
- (4) Capital and farming
- (5) Definition, measure & characteristics of capital
- (6) Productivity
- (7) Present value

#### D. Technological Base

- (1) What is technology
- (2) Technology and change
- (3) Technology and farming in U.S.

#### E. Interregional competition

- (1) Enterprise relationships
- (2) Specialization vs. diversification
- (3) Comparative advantage

#### IV. The Economics of Producing Goods & Services

##### A. Concepts & Principles

- (1) Elements of the production process
- (2) Increasing, diminishing and constant returns
- (3) Difference between farming and industrial production

##### B. Simple Physical Production Relationships

- (1) TPP, MPP & APP
- (2) Types of production functions
- (3) Impact of technology
- (4) Application of input-output analysis
- (5) Stages of production function
- (6) Single variable input and output

##### C. Costs & Returns

- (1) The concept of costs and profits: variable and fixed
- (2) TC, AC, MC, TR, MR, Profit
- (3) Relationship of costs to physical production function
- (4) Relationship of costs and revenue to output

##### D. Determination of Optimum Production

- (1) Value of product concept
- (2) Totals: revenue minus costs
- (3) Marginal cost and marginal revenue

##### E. Multiple Input-Output Relationships

- (1) Factor-factor
- (2) Product-product
- (3) Factor-product
- (4) Choosing the optimum combination
- (5) Production possibilities

##### F. Linear Programming

## V. Price Determination & Equilibrium

### A. The Supply Curve

- (1) Derivation of supply curve
- (2) Shape of supply curve
- (3) Change in supply vs. change in quantity supplied
- (4) Determination of industry supply
- (5) Factors shifting supply

### B. Elasticity of Supply

- (1) Calculation
- (2) Causes of change
- (3) Firm vs. industry
- (4) Short run vs. long run

### C. The Demand Curve

- (1) Concept of utility
- (2) Consumer behavior
- (3) Change or shift in demand
- (4) Factors affecting demand

### D. Price Elasticity of Demand

- (1) Calculation
- (2) Impact of price or quantity changes
- (3) Relation to TR
- (4) Determinants of price elasticity

### E. Other Uses of Elasticity

- (1) Cross elasticity
- (2) Elasticity of agricultural products
- (3) Income elasticity of demand
- (4) Elasticity and substitution

### F. Market Equilibrium Determination

- (1) Interaction of supply and demand
- (2) The cobweb theorem
- (3) Equilibrium condition
- (4) Impact of government support and aid programs



## VI. Marketing Food and Fiber Products

### A. Marketing Principles

- (1) Definitions
- (2) Development of our system
- (3) Organizational aspects

### B. Market Models

- (1) Pure competition
- (2) Monopoly
- (3) Oligopoly
- (4) Imperfect competition

### C. Approaches to Studying Market Structure

- (1) Functional
- (2) Commodity
- (3) Institutional

### D. The Costs of Marketing and Pricing Policies

- (1) Constant margin
- (2) Increasing cost margin

### E. Research and Development

- (1) Products or services
- (2) Sales, promotion and advertising
- (3) Basic methods of research
- (4) Evaluation of research

### F. Trends and Performance

- (1) Wholesale
- (2) Retail
- (3) Processing

### G. Forms of Business Ownership

- (1) Private enterprise
- (2) Corporations
- (3) Psuedo-corporations
- (4) Cooperatives

VII. Management: Agribusiness and Farm

A. Management Concepts

- (1) Management and its meaning
- (2) Production, marketing and financial management
- (3) Management: functions and principles
- (4) Personnel management
- (5) Risk and uncertainty in management

B. Financial Statements and Analysis

- (1) Basic accounting concepts
- (2) Measurement of income
- (3) Fixed assets and depreciation
- (4) Financial statement analysis

C. Budgeting Analysis

- (1) Complete budget
- (2) Partial budget
- (3) Capital budget

D. Breakeven Analysis

- (1) Calculation
- (2) Usefulness

E. Organization of Productive Resources

- (1) Acquisition of Capital
- (2) Size of operation: buying or renting
- (3) Enterprise combination

F. Farm Management

- (1) Crops
- (2) Soil and water
- (3) Livestock
- (4) Labor
- (5) Machinery
- (6) Buildings

VIII. Consumer Economics

A. The Consumer Movement and Social Economics

- (1) Economic inequality
- (2) Poverty, affluence and the quality of life
- (3) Today's consumer
- (4) Consumer production

B. Consumer Action Programs

- (1) Consumer protection
- (2) Federal Trade Commission
- (3) Consumer's Union
- (4) Negative income tax
- (5) Guaranteed jobs
- (6) Programs for poverty and inequality

C. Consumer Education

- (1) Adult programs
- (2) Urban extension
- (3) Formal schooling
- (4) Colleges and universities
- (5) Technical schools

D. Seller Beware Programs

- (1) Truth in packaging, advertising, etc.
- (2) Pricing policies
- (3) Controls and regulations

IX. World Agricultural Situation

A. Overview

- (1) Population: growth and distribution
- (2) Education

B. Traditional Agriculture

C. Transforming Agriculture

- (1) Green revolution
- (2) Transfer of knowledge
- (3) Aid programs
- (4) Agrarian reform

D. Income and Growth

E. Marketing Structure

F. Finance and Capitalization

G. World Trade

X. Special and Current Topics

Appendix

B

Examples of Five Types of Exam Questions  
Suitable for Machine Grading  
for  
Ag. Ec. 100

Agricultural Economics 100  
First Midterm

Name \_\_\_\_\_

Seat \_\_\_\_\_

I. INDICATE WHETHER THE FOLLOWING STATEMENTS ARE TRUE = A OR FALSE = B.

1. T F Interest rates rise when money is scarce.
2. T F Fiscal policy is less politically oriented than monetary policy.
3. T F The discount rate is the rate of interest which the Federal Reserve Board charges for loans to the government.
4. T F Devaluation usually offers no permanent solution to monetary problems.
5. T F Since human wants are insatiable, the GNP of a country can be guaranteed to rise each year.
6. T F Index numbers can be used to compare the change in prices of various farm products.
7. T F All economics systems whether capitalistic or communistic must have a system of pricing to establish economic order.
8. T F The main difference between Fascism and Communism is the difference in the control of personal property.

II. CHECK THE ALTERNATIVE RESPONSE WHICH MOST NEARLY SATISFIES EACH OF THE FOLLOWING STATEMENTS.

9. The price earnings ratio is found by using which of the following formulas?
  - a.  $P/E = \text{current price of stock times earnings per share}$
  - b.  $P/E = \text{current price of stock plus earnings per share}$
  - c.  $P/E = \text{current price of stock minus earnings per share}$
  - d.  $P/E = \text{current price divided by earnings per share}$
  - e. none of the above
10. Shares that have superior right to dividends
  - a. are preferred shares
  - b. are common shares
  - c. are stock certificates
  - d. are corporate charter shares
  - e. are par stock shares

III. COMPLETE THE FOLLOWING STATEMENTS WITH THE APPROPRIATE WORD OR TERM FOLLOWING EACH STATEMENT. THE QUESTION NUMBER IS GIVEN IN ( ) BY EACH BLANK.

(17) Usually it is best to use \_\_\_\_\_ term loans for \_\_\_\_\_ use(s).

- a. short, short term
- b. short, long term
- c. long, short term
- d. short, all
- e. long, all

(18) \_\_\_\_\_ embraces governmental tax and expenditure programs designed to have an effect on the nation's economy.

- a. The Federal Reserve Board
- b. Fiscal policy
- c. Monetary Policy
- d. U.S. Treasury
- e. none of the above

The (19) \_\_\_\_\_ index means that the computed value takes into account the relative importance of the various parts.

- a. weighted
- b. simple
- c. average
- d. price
- e. normal

IV. SELECT THE RESPONSE WHICH MOST CORRECTLY DEFINES EACH OF THE FOLLOWING TERMS.

25. An economic good

- a. a scarce good
- b. a good that can be bought cheaply
- c. some good that is plentiful for everyone
- d. an agricultural product
- e. manufactured products

26. Consumer price index (CPI)

- a. the amount of money spent every month by the average American family
- b. the portion of the salary used to buy food products
- c. an index that takes into consideration the difference in quality of those items bought monthly by households
- d. a weighted index indicating the fluctuations of the prices of those items bought by a family on a monthly basis
- e. the average of prices consumers pay for goods and services

27. Index number

- a. a multiple of 100
- b. a price that you can compare with other prices
- c. a quantity that you can compare with other quantities
- d. a relative number used to look at a change in quantity or prices from a base period
- e. more than one of the above

IDENTIFY THE FOLLOWING TERMS USING THE NUMBER AT RIGHT WHICH CORRESPOND TO SPECIFIC DEFINITIONS LISTED BELOW

Select one of the following responses

	A	B	C	D	E
42. Barter economy	1	2	3	4	5
43. Cobweb theorem	1	3	5	7	8
44. Normal profit	5	6	7	8	9
45. Price leader	3	5	6	10	13
46. Substitute product	3	4	12	13	14
47. Nominal interest rate	7	8	9	10	12
48. Cartel	5	6	11	13	14
49. Speculator	10	11	12	13	14
50. Parity price	1	7	8	9	12
51. Most favored nation clause	4	6	12	13	14

1. Product price and quantity fluctuation which tends toward a stable or instable market situation.
2. The returns to the manager of a business.
3. An increase in the price of one product will increase the demand for another product.
4. Exchange of goods for goods without the use of money.
5. A firm whose pricing decisions will be generally followed by other firms in the industry.
6. Organization of business firms to control price and/or output in a market.
7. The return to the owners of a firm which <sup>is</sup> just sufficient to keep the firm producing in the long run.
8. Stated interest rate on a security or loan.
9. The actual yield or interest rate on a security or loan.
10. Desire to hold futures contracts (buy) in the belief that prices will rise.
11. One who sells his product on a futures contract when he is in possession of the product in the cash market.
12. Price which yields an equivalence to some defined standard.
13. Trade agreement whereby nations agree to extend to each other the same tariff and trade agreements that they might extend to other non-signatory nations.
14. Customs duty or tax imposed by a government on importation of a good.



V. PROBLEM: ALTERNATIVE ANSWERS TO EACH PART OF THE PROBLEM ARE GIVEN AT THE RIGHT. SELECT THE MOST APPROPRIATE RESPONSE.

Suppose Haiti and the Dominican Republic were cut off from the rest of the world. These countries have never before traded with each other. With one man-hour the countries can produce the following quantities:

	Wheat (lbs.)	Cloth (yds.)
Haiti (H)	5	10
Dominican Republic (DR)	2	3

Select one of the following responses

	A	B	C	D	E
How many minutes of labor must Haiti use to produce:					
52. one lb. of wheat?	8	10	12	14	16
53. one yd. of cloth?	4	6	8	10	12
How many minutes of labor must the D.R. use to produce:					
54. one lb. of wheat?	20	30	40	50	60
55. one yd. of cloth?	20	30	40	50	60
56. The labor-cost of each product is clearly less in <u>Haiti</u> (1) or the <u>Dominican Republic</u> (2).	1	2			
57. Haiti has a <u>comparative</u> (1) or <u>absolute</u> (2) advantage in the production of both products?	1	2			
58. The Dominican Republic has a <u>comparative</u> (1) <u>absolute</u> (2) advantage in the production	1	2			
59. of <u>wheat</u> (1) <u>cloth</u> (2)	1	2			
Assuming favorable terms of trade, Haiti would specialize in					
60. <u>wheat</u> (1) <u>cloth</u> (2)	1	2			
The D.R. would specialize in					
61. <u>wheat</u> (1) <u>cloth</u> (2)	1	2			
Before specialization, Each country has 100 man-hours of labor which it divides equally between the production of the two products. Together, the two countries can produce the following amounts of					
62. wheat (lbs.)	100	250	350	450	500
63. cloth (yds.)	150	500	550	600	650

# Futures Prices

Wednesday, January 8, 1975						
	Open	High	Low	Close	Change	Season's High Low
<b>CHICAGO - WHEAT</b>						
Mar	418	423	409	422-423	+1to2	556 350
May	412	420	406½	417½-420	-¼to+2¼	557 367
July	389	397	385	395-396	+1½to2½	509 385
Sept	395	403	392	401	+2	513 392
Dec	405	412	400	410	+1	523 400
<b>CORN</b>						
Mar	338	340¾	334	338½-339	-3to2½	409 214
May	340	342½	336	340½-341	-3to2½	413 240½
July	339	340½	334	340-339½	-2½to3	411 303
Sept	318	320½	314	319-320	-2to1	388½ 307
Dec	286	289	283	288-288½	-2½to2	355 281
Mar 76	293	293	288	293	-3	358 285½
<b>OATS</b>						
Mar	162	164½	160¾	164-164½	+¼to¾	207 120
May	161	163½	159½	163¼-163½	+¼to½	208½ 147
July	155	157¾	153	157½-157¾	+¼to½	198½ 152
Dec	156½	158½	155¾	157¼-158	-1¼to½	188 150
<b>SOYBEANS</b>						
Jan	676	676	665½	670	-15½	961 509
Mar	692	692	682½	683-684	-19½to18½	969 511
May	696½	705	696½	698-696½	-18½to20	971 531
July	710	714	702½	704½	-18	972½ 702½
Aug	699	707	699	701	-18	961 699
Sept	680	680	670	672	-18	945 670
Nov	665	670	657	660	-15½	869 657
Jan 76	671	676	662	667	-15	860 662

In addition to the January 8, 1975 futures quotations, assume that:

grain contract	5,000 bu.
interest rate	10%
required margin/contract	\$7,000
broker's commission	\$50/contract
soybean yield	40 bu/A.
wheat yield	50 bu/A.
cost of producing soybeans	\$100/A.
cost of producing wheat	\$ 80/A.
basis (Columbus-Chicago)	\$.30/bu.

Using the above information, respond to the following:

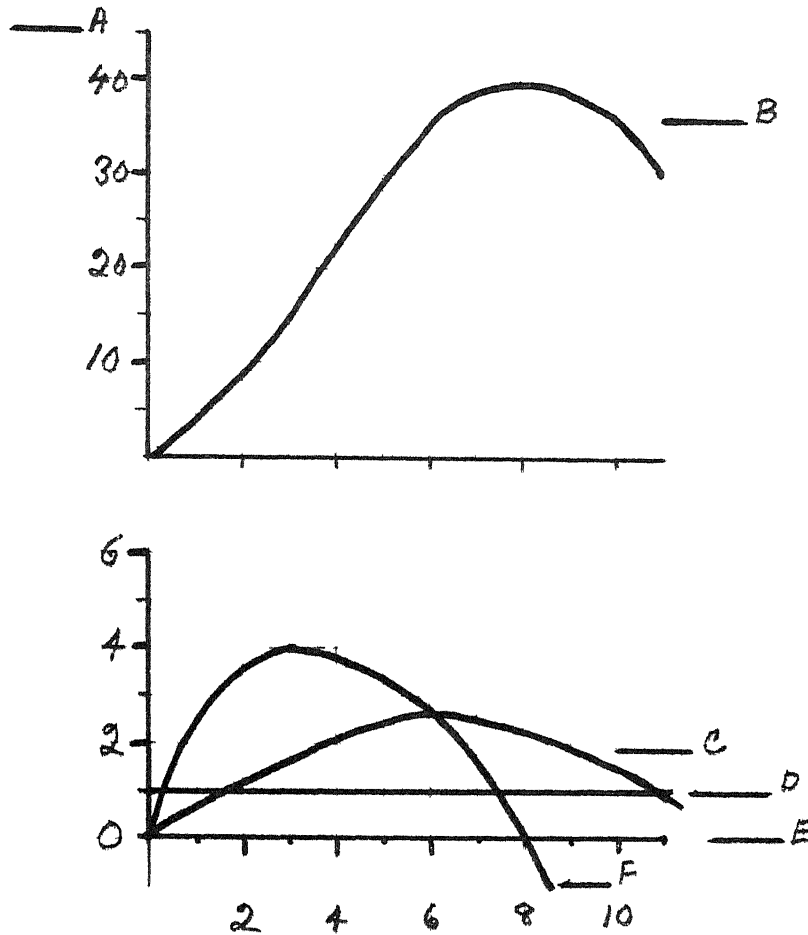
37. On January 2, 1975, you purchased 10 contracts of December wheat at 416 and sold at the closing price on January 8th (i.e., one week later). Calculate your net profit, or loss, situation (rounded to nearest dollar).
  - a. \$3,000 loss
  - b. 3,000 gain
  - c. 3,635 loss
  - d. 2,365 loss
  - e. 2,365 gain
  
38. How much profit could be "locked in" if the maximum number of contracts from 500 acres of soybeans were hedged at the September closing price? (Assume that the contract is held for exactly 9 months.)
  - a. \$84,400
  - b. 78,400
  - c. 75,525
  - d. 74,650
  - e. none of the above

39. Mr. Smith would like to purchase a pizza parlor which costs \$200,000. The pizza parlor provides a gross return of \$100,000/year. The managerial expense per year is \$15,000, the labor expense is \$18,000, supply and maintenance expenses are \$25,000, and miscellaneous expenses are \$2,000 per year. Assuming interest rates are 10% and ignoring taxes, calculate the payback period (in years) for this investment.

- a. 5
- b. 10
- c. 15
- d. 20
- e. 25

Year					
1	2	3	4	5	6
.91	.81	.73	.66	.59	.53

40. Given the above present value information for \$1.00 discounted at 11% for each of six years, what would be the present value of a promised \$10,000 from your "rich uncle" (\$5,000 at the end of each of the two years) following your graduation from OSU? (Assume that it takes you just 4 years to graduate.)
- a. \$ 5,600
  - b. 8,600
  - c. 10,000
  - d. 15,550
  - e. 21,150



Fill in the blanks A through F in the graph above and respond to the following:

33. Stage II begins when how many units of input are used?

- a. 2
- b. 4
- c. 6
- d. 8
- e. 10

34. The optimum level of production is when \_\_\_\_\_ units of input are used.

- a. 1.5
- b. 3.0
- c. 6.0
- d. 7.5
- e. 11.0

35. The addition to total revenue from producing one additional unit of this product is:

- |           |           |                 |
|-----------|-----------|-----------------|
| a. \$1.00 | c. \$3.00 | e. insufficient |
| b. 2.00   | d. 4.00   | information     |

Appendix

C

Item Analysis Program

OSU  
Office of Evaluation

Office of Evaluation  
Item Analysis Program

The Following Should aid in Interpreting the Analysis

TEST SCORE DISTRIBUTION

Raw Score (or WTD Score). The total score on this test of correct (WTD) responses.

Frequency. The number of students who obtained a certain score on this test.

Cumulative Frequency. The cumulative count of students at any score interval.

Percentile Rank. The percent of students who score at or below any given score interval.

Standard Score Distribution. A conversion of each raw score to a standard score having a mean of 500 and a standard deviation of 100.

SUMMARY STATISTICS

Mean. The average of all scores (obtained by summing the scores and dividing by the number of scores).

Median. The score below which and above which fifty percent of the scores lie.

Mode. That point on the score scale where the most frequencies occur.

Standard Deviation. The spread or the variability of the scores around the mean and a statistic associated with the normal curve (in a normal distribution, one standard deviation on either side of the mean encompasses approximately 68 percent of the cases. Two SD units on either side of the mean encompass approximately 90 percent of the cases).

Skewness. The degree which the frequency distribution or curve departs from a symmetrical shape.

Kurtosis. The relative degree of flatness or peakedness of the part of a frequency curve that lies near the mode, as compared with that part of the normal frequency curve.

ITEM ANALYSIS

Total Correct. The total number of students answering the item correctly.

Upper. Refers to the top 27.5 percent of the cases and lower to the bottom 27.5 (unless otherwise specified).

1 2 3 4 5. Refers to options (the starred option is the correct response furnished by the instructor, BLK is the number omitting the item. ERR refers to impossible and invalid responses).

Number Under Each Option. The total number of students in each group making that choice and the numbers in ( ) are the percent in each group making that choice.

REL DIFF. The relative difficulty of the item and the percentage of students missing the item (as the percentage increases the item is more difficult).

CORR PHI. The corrected PHI coefficient and an item-item relationship between the upper and lower group.

RPBIS. The point biserial correlation coefficient. It shows the relationship of the item to the total score on the test thus giving a measure of the validity of that item.

Obtained D. The discrimination index. It reflects the degree to which the item discriminates between the upper and lower groups.

MAX. Refers to the highest discrimination index which we could hypothetically expect between the groups.

EFF. Refers to the efficiency of this item and the ratio of the obtained D to the maximum D.

#### SUMMARY STATISTICS

KR 20. An index of the internal consistency of the test and a function of the number of items on the test, the variability of the scores, and the proportion passing and failing each item.

KR 21. Also an estimate of internal consistency or reliability and computed as the KR 20 except the mean score of the group is used instead of the proportion passing and failing each item.

OHIO STATE UNIVERSITY

OFFICE OF EVALUATION

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JOB NUMBER 1369  
DATE 01/15/75

DEPARTMENT 1114  
INSTRUCTOR WESSEL-100 GREEN

COURSE NUMBER 100  
TIME

TEST SCORE DISTRIBUTION  
ALL ITEMS, WEIGHTED SCORE

WTD SCORE	FREQUENCY	CUMULATIVE FREQUENCY	PERCENTILE RANK	STANDARD SCORE
28	1	60	99.2	686.8
26	11	59	89.2	624.2
24	10	48	71.7	561.6
22	20	38	46.7	499.0
20	11	18	20.8	436.3
18	1	7	10.8	373.7
16	3	6	7.5	311.1
14	3	3	2.5	248.5

SUMMARY STATISTICS

NUMBER OF ITEMS ON TEST	14
NUMBER OF STUDENTS	60
MEAN	22.03
STANDARD DEVIATION	3.19
STANDARD SCORE MEAN	500.00
STANDARD SCORE S.D.	100.00
MEDIAN	22
MODE	22
SKEWNESS	-0.72
KURTOSIS	0.41
MAXIMUM	28
MINIMUM	14
RANGE OF SCORES	14



OHIO STATE UNIVERSITY

OFFICE OF EVALUATION

PAGE 3

JOB NUMBER 1369  
DATE 01/15/75DEPARTMENT 1114  
INSTRUCTOR WESSEL-100 GREENCOURSE NUMBER 100  
TIMETEST SCORE DISTRIBUTIONALL ITEMS, UNWEIGHTED

RAW SCORE	FREQUENCY	CUMULATIVE FREQUENCY	PERCENTILE RANK	STANDARD SCORE
14	1	60	99.2	686.8
13	11	59	89.2	624.2
12	10	48	71.7	561.6
11	20	38	46.7	499.0
10	11	18	20.8	436.3
9	1	7	10.8	373.7
8	3	6	7.5	311.1
7	3	3	2.5	248.5

SUMMARY STATISTICS

NUMBER OF ITEMS ON TEST	14
NUMBER OF STUDENTS	60
MEAN	11.02
STANDARD DEVIATION	1.60
STANDARD SCORE MEAN	500.00
STANDARD SCORE S.D.	100.00
MEDIAN	11
MODE	11
SKEWNESS	-0.71
KURTOSIS	0.37
MAXIMUM	14
RANGE OF SCORES	7

JOB NUMBER 1369  
DATE 01/15/75

DEPARTMENT 1114  
INSTRUCTOR WESSEL-100 GREEN

COURSE NUMBER 100  
TIME

ITEM ANALYSIS

ITEM	STATISTICS	MULTIPLE CHOICE RESPONSES AND PERCENTAGES ( )							
1	TOTAL CORRECT REL DIFF N= 31 PCT=51.7 .483 CORR PHI= .454 (SIG= .02) RPBIS= .282 (ITEM-TOTAL) DISCRIMINATION INDICES OBTAINED D= 30.6	UPPER (PCT)	1 (25)	2 (75)	3 (0)	4 (0)	5 (0)	BLNK (0)	ERR (0)
		LOWER (PCT)	10 (56)	8*** (44)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
		TOTAL (PCT)	29 (48)	31*** (52)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
2	TOTAL CORRECT REL DIFF N= 56 PCT=93.3 .067 CORR PHI= .337 (SIG= .10) RPBIS= .045 (ITEM-TOTAL) DISCRIMINATION INDICES OBTAINED D= 11.1	UPPER (PCT)	1 (0)	2 (99)	3 (0)	4 (0)	5 (0)	BLNK (0)	ERR (0)
		LOWER (PCT)	2 (11)	16*** (89)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
		TOTAL (PCT)	4 (7)	56*** (93)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
3	TOTAL CORRECT REL DIFF N= 42 PCT=70.0 .300 CORR PHI= .884 (SIG= .001) RPBIS= .394 (ITEM-TOTAL) DISCRIMINATION INDICES OBTAINED D= 55.6	UPPER (PCT)	1 (0)	2 (99)	3 (0)	4 (0)	5 (0)	BLNK (0)	ERR (0)
		LOWER (PCT)	10 (56)	8*** (44)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
		TOTAL (PCT)	18 (30)	42*** (70)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
4	TOTAL CORRECT REL DIFF N= 58 PCT=96.7 .033 CORR PHI= -.353 (SIG= .10) RPBIS= -.114 (ITEM-TOTAL) DISCRIMINATION INDICES OBTAINED D= -8.3	UPPER (PCT)	11*** (92)	2 (8)	3 (0)	4 (0)	5 (0)	BLNK (0)	ERR (0)
		LOWER (PCT)	18*** (99)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
		TOTAL (PCT)	58*** (97)	2 (3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
5	TOTAL CORRECT REL DIFF N= 54 PCT=90.0 .100 CORR PHI= .685 (SIG= .01) RPBIS= .386 (ITEM-TOTAL) DISCRIMINATION INDICES OBTAINED D= 27.8	UPPER (PCT)	1 (0)	2 (99)	3 (0)	4 (0)	5 (0)	BLNK (0)	ERR (0)
		LOWER (PCT)	5 (28)	13*** (72)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
		TOTAL (PCT)	6 (10)	54*** (90)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
6	TOTAL CORRECT REL DIFF N= 29 PCT=48.3 .517 CORR PHI= .685 (SIG= .01) RPBIS= .199 (ITEM-TOTAL) DISCRIMINATION INDICES OBTAINED D= 36.1	UPPER (PCT)	1 (58)	2 (42)	3 (0)	4 (0)	5 (0)	BLNK (0)	ERR (0)
		LOWER (PCT)	4*** (22)	14 (78)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
		TOTAL (PCT)	29*** (48)	31 (52)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)

JOB NUMBER 1369  
DATE 01/15/75

DEPARTMENT 1114  
INSTRUCTOR WESSEL-100 GREEN

COURSE NUMBER 100  
TIME

ITEM	STATISTICS	MULTIPLE CHOICE RESPONSES AND PERCENTAGES ( )							
9	TOTAL CORRECT REL DIFF N= 50 PCT=83.3 .167 CORR PHI= .729 (SIG=.01) RPBIS= .397 (ITEM-TOTAL) DISCRIMINATION INDICES OBTAINED D= 33.3	UPPER (PCT)	1 0 ( 0)	2 12*** (99)	3 0 ( 0)	4 0 ( 0)	5 0 ( 0)	BLNK 0 ( 0)	ERR 0 ( 0)
		LOWER (PCT)	6 (33)	12*** (67)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)
		TOTAL (PCT)	10 (17)	50*** (83)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)
10	TOTAL CORRECT REL DIFF N= 38 PCT=63.3 .367 CORR PHI= .884 (SIG=.001) RPBIS= .441 (ITEM-TOTAL) DISCRIMINATION INDICES OBTAINED D= 58.3	UPPER (PCT)	11*** (92)	2 1 ( 8)	3 0 ( 0)	4 0 ( 0)	5 0 ( 0)	BLNK 0 ( 0)	ERR 0 ( 0)
		LOWER (PCT)	6*** (33)	12 (67)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)
		TOTAL (PCT)	38*** (63)	22 (37)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)
11	TOTAL CORRECT REL DIFF N= 58 PCT=96.7 .033 CORR PHI= .0 (SIG=N.S.) RPBIS= -.056 (ITEM-TOTAL) DISCRIMINATION INDICES OBTAINED D= 0.0	UPPER (PCT)	1 0 ( 0)	2 12*** (99)	3 0 ( 0)	4 0 ( 0)	5 0 ( 0)	BLNK 0 ( 0)	ERR 0 ( 0)
		LOWER (PCT)	0 ( 0)	18*** (99)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)
		TOTAL (PCT)	2 ( 3)	58*** (97)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)
12	TOTAL CORRECT REL DIFF N= 58 PCT=96.7 .033 CORR PHI= .233 (SIG=N.S.) RPBIS= .176 (ITEM-TOTAL) DISCRIMINATION INDICES OBTAINED D= 5.6	UPPER (PCT)	12*** (99)	2 0 ( 0)	3 0 ( 0)	4 0 ( 0)	5 0 ( 0)	BLNK 0 ( 0)	ERR 0 ( 0)
		LOWER (PCT)	17*** (94)	1 ( 6)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)
		TOTAL (PCT)	58*** (97)	2 ( 3)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)
13	TOTAL CORRECT REL DIFF N= 43 PCT=71.7 .283 CORR PHI= .750 (SIG=.001) RPBIS= .447 (ITEM-TOTAL) DISCRIMINATION INDICES OBTAINED D= 41.7	UPPER (PCT)	11*** (92)	2 1 ( 8)	3 0 ( 0)	4 0 ( 0)	5 0 ( 0)	BLNK 0 ( 0)	ERR 0 ( 0)
		LOWER (PCT)	9*** (50)	9 (50)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)
		TOTAL (PCT)	43*** (72)	17 (28)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)
14	TOTAL CORRECT REL DIFF N= 48 PCT=80.0 .200 CORR PHI= .729 (SIG=.01) RPBIS= .475 (ITEM-TOTAL) DISCRIMINATION INDICES OBTAINED D= 33.3	UPPER (PCT)	1 0 ( 0)	2 12*** (99)	3 0 ( 0)	4 0 ( 0)	5 0 ( 0)	BLNK 0 ( 0)	ERR 0 ( 0)
		LOWER (PCT)	6 (33)	12*** (67)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)
		TOTAL (PCT)	12 (20)	48*** (80)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)	0 ( 0)

JOB NUMBER 1369  
DATE 01/15/75

DEPARTMENT 1114  
INSTRUCTOR WESSEL-100 GREEN

COURSE NUMBER 100  
TIME

SUMMARY STATISTICS

## TOTAL TEST STATISTICS -- TEST DISTRIBUTION

NUMBER OF STUDENTS TAKING TEST = 60  
NUMBER OF ITEMS IN TEST = 14

MEAN TEST SCORE = 22.03  
MEDIAN = 22  
MODE = 22

MAXIMUM = 28  
MINIMUM = 14

STANDARD DEVIATION = 3.19  
SKEWNESS = -0.72  
KURTOSIS = 0.41

RANGE = 14

## GROUP STATISTICS

	PERCENT STUDENTS	NUMBER STUDENTS	MEAN SCORE
TOTAL	100.00	60	22.033
UPPER	20.00	12	26.167
LOWER	30.00	18	18.222

RELIABILITY ESTIMATES

KUDER-RICHARDSON 20 = 0.865  
KUDER-RICHARDSON 21 = 0.085

STANDARD ERROR OF MEASUREMENT = 3.054

## ITEM ANALYSIS

## ITEM DIFFICULTY DISTRIBUTION

RANGE	NUMBER OF ITEMS	PERCENTAGE OF ITEMS
.81-1.00	0	0
.61-.80	0	0
.41-.60	2	14
.21-.40	4	29
.00-.20	8	57

MEAN ITEM DIFFICULTY = .213

## ITEM DISCRIMINATION DISTRIBUTION

RANGE	NUMBER OF ITEMS	PERCENTAGE OF ITEMS
.81-1.00	0	0
.61-.80	0	0
.41-.60	4	29
.21-.40	6	43
.00-.20	3	21
BELOW .00	1	7

MEAN ITEM DISCRIMINATION = .284

STUDENT SCORES

OHIO STATE UNIVERSITY

OFFICE OF EVALUATION

JOB NUMBER 1369  
DATE 01/15/75

DEPARTMENT 1114  
INSTRUCTOR WFESSEL-100 GREEN

SUBJECT ID	NUM	SCORE	PCT	TSCR	RAWTEST
ANDREWS K T	10	22	467	4990	11
BELCHER S E	56	26	892	6242	13
BELL S L	23	26	892	6242	13
BINGGELI R	2	22	467	4990	11
BOGGS N M	26	26	892	6242	13
CARPENTE R A	46	22	467	4990	11
CLARK T	34	14	25	2485	7
CLUXTON B	21	22	467	4990	11
COOPER S E	20	22	467	4990	11
CORY J A	22	26	892	6242	13
COTTRILL H A	50	24	717	5616	12
DALZELL J S	16	26	892	6242	13
DELLINGE J D	36	20	208	4363	10
DENGER D L	52	24	717	5616	12
DOBBINS K	14	20	208	4363	10
EDMUNDSO M W	30	20	208	4363	10
EDWARDS J T	6	16	75	3111	8
FITZSIMM R D	59	24	717	5616	12
FRAMBES D W	8	20	208	4363	10
GERNATT D L	53	22	467	4990	11
GLIOZZI L W	48	22	467	4990	11
GRANO J A	31	24	717	5616	12
HARDEN M	3	14	25	2485	7
HENRY A	58	22	467	4990	11
HOLLAND H R	54	26	892	6242	13
HORNING P E	33	26	892	6242	13
IANNARIN M J	45	20	208	4363	10
KAPLE D J	55	20	208	4363	10
KEEHAN M M	19	22	467	4990	11
KLEIN T G	49	24	717	5616	12
KLINGELH K C	43	16	75	3111	8
KMETZ M M	47	24	717	5616	12
LACKEY R J	40	26	892	6242	13
LESE R A	1	14	25	2485	7
LUCAS C A	12	18	108	3737	9
LYBARGER A E	13	22	467	4990	11
LYNCH K L	57	24	717	5616	12
MECKES L S	35	22	467	4990	11
MICHELBR M G	18	26	892	6242	13
MILLER F D	51	16	75	3111	8
MONTGOME J L	28	20	208	4363	10
MOORE R J	37	22	467	4990	11
MUELLER J A	4	24	717	5616	12
MYERS J	15	26	892	6242	13
ODONNELL K A	25	22	467	4990	11
POST M J	5	22	467	4990	11
POULSEN G S	39	20	208	4363	10
POWERS L S	27	22	467	4990	11
QUINBY M A	41	28	992	6868	14
ROBERTSO A T	44	20	208	4363	10
SCHILLIN J L	17	20	208	4363	10
SHEALY D W	7	22	467	4990	11
SHERMAN T S	9	24	717	5616	12
SINGER S F	32	22	467	4990	11
STEDMAN R	11	20	208	4363	10
STEINES R A	38	22	467	4990	11
STRADER M J	42	22	467	4990	11
WACK D E	29	24	717	5616	12
WANSOR J	24	22	467	4990	11
ZIMMERMA G W	60	26	892	6242	13